

CLAIMS

1. A method for determining a final approach path (Aa) of an aircraft for a non-precision approach, for the purpose of landing the aircraft on a runway (5), wherein:

- a) there is determined an approach mode which has been selected by the pilot of the aircraft from among a plurality of predetermined approach modes;
- b) there is selected a characteristic segment (6) of an arrival path which relates to the selected approach mode thus determined;
- c) the orientation of the projection on the ground of the said characteristic segment (6) is determined with respect to the center line (Ap) of the said runway (5); and
- d) depending on this orientation, there is determined:
 - an anchoring point (P) of the said final approach path (Aa);
 - the orientation (α) in a horizontal plane of the said final approach path (Aa); and
 - the slope (β) of the said final approach path (Aa).

2. The method as claimed in claim 1, wherein, in step d), there is determined:

- as the orientation (α) of the said final approach path (Aa), the orientation of the said characteristic segment (6); and
- as the slope (β) of the said final approach path (Aa), the slope of the said characteristic segment (6).

3. The method as claimed in claim 1 wherein, when the projection on the ground of the said characteristic segment (6) is aligned with the center line (Ap) of the runway (5), the following operations are carried out in step d):

- d1) there is determined a characteristic point (MAP) corresponding to the limit point at which the pilot must overshoot when the approach is aborted;
- d2) there is determined the relative position between the projection on the ground of the said characteristic point (MAP) and the threshold (S) of the runway (5); and

d3) the said anchoring point (P) of the said final approach path (Aa) is determined according to this relative position.

4. The method as claimed in claim 3 wherein, when the projection on the ground of the characteristic point (MAP) is located on or downstream of the threshold (S) of the runway (5) with respect to the direction of approach (E) of the aircraft, in step d3) there is determined, as an anchoring point (P) of the said final approach path (Aa), the point of intersection between the said characteristic segment (6) and a horizontal plane located at a predetermined altitude.

5. The method as claimed in claim 3 wherein, when the projection on the ground of the characteristic point (MAP) is located upstream of the threshold (S) of the runway (5) with respect to the direction of approach (E) of the aircraft, in step d3) there is determined, as an anchoring point (P) of the said final approach path (Aa), the point of intersection (Pi) of the extension toward the ground of the said characteristic segment (6) and a horizontal plane located at a predetermined altitude.

6. The method as claimed in claim 1 wherein, when the projection on the ground of the said characteristic segment (6) is not aligned with the center line (Ap) of the runway (5), in order to determine, in step d), the said anchoring point (P) of the said final approach path (Aa):

- there is determined a reference point (R) from which the pilot is considered to initiate a rotation of the aircraft in order to join a vertical plane containing the center line (Ap) of the runway (5), according to a reference path (T);
- the said reference path (T) is determined;
- there is determined a horizontal straight line (D) which is located in a horizontal plane which is at a predetermined altitude and which is partially merged with the vertical projection on the said horizontal plane of the said characteristic segment (6); and
- there is determined, as an anchoring point (P), the point which is such that:
 - on the one hand, the vertical projection of the final approach path (Aa) on the said horizontal plane is partially merged with the said horizontal straight line (D); and

- on the other hand, the distance between the said point and the reference point (R) along the final approach path (Aa) is substantially equal to the distance between the said reference point (R) and the threshold (S) of the runway (5) along the said reference path (T).

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7. The method as claimed in claim 1 wherein, when the projection on the ground of the said characteristic segment (6) is not aligned with the center line (Ap) of the runway (5), in order to determine, in step d), the said anchoring point (P) of the said final approach path (Aa):

- 10 - there is determined a reference point (R) from which the pilot is considered to initiate a rotation of the aircraft in order to join a vertical plane containing the center line (Ap) of the runway (5), according to a reference path (T);
- the said reference path (T) is determined; and
- 15 - there is determined, as an anchoring point (P), the point which is such that the distance between the latter and the vertical projection of the said reference point (R) on a horizontal plane located at a predetermined altitude is substantially equal to the distance between the vertical projections on the said horizontal plane of the said reference point (R) and of the threshold (S) of the runway (5), along the vertical
- 20 projection of the said reference path (T) on the said horizontal plane.

8. The method as claimed in claim 1 wherein, when the projection on the ground of the said characteristic segment (6) is not aligned with the center line (Ap) of the runway (5), in order to determine, in step d), the said anchoring point (P) of the said final approach path (Aa):

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- there is determined a reference point (R) from which the pilot is considered to initiate a rotation of the aircraft in order to join a vertical plane containing the center line (Ap) of the runway (5), according to a reference path (T); and
- 30 - there is determined, as an anchoring point (P), the point which is such that the distance between the latter and the said reference point (R) is substantially equal to the distance between the said reference point (R) and the threshold (S) of the runway (5).

9. The method as claimed in claim 1 wherein, when the projection on the ground of the said characteristic segment (6) is not aligned with the center line (Ap) of the runway (5), in order to determine, in step d), the said anchoring point (P) of the said final approach path (Aa):

- 5 - there is determined a horizontal straight line (D) which is located in a horizontal plane which is at a predetermined altitude and which is partially merged with the vertical projection on the said horizontal plane of the said characteristic segment (6);
- 10 - there is determined an intermediate point (I) which corresponds to the intersection between the said horizontal straight line (D) and the vertical projection on the said horizontal plane of the center line (Ap) of the runway (5);
- 15 - there is determined a circle (C) having the said intermediate point (I) as its center and the distance between this intermediate point (I) and the vertical projection on the said horizontal plane of the threshold (S) of the runway (5) as its radius; and
- there is determined, as an anchoring point (P), the intersection between the said circle (C) and the said horizontal straight line (D).

20 10. The method as claimed in claim 1 wherein, when the projection on the ground of the said characteristic segment (6) is not aligned with the center line (Ap) of the runway (5), in step d), there is used, as an anchoring point (P) of the said final approach path (Aa), a predetermined final point, which is characteristic of the said approach mode selected by the pilot of the aircraft.

25 11. The method as claimed in claim 1 wherein, when the projection on the ground of the said characteristic segment (6) is not aligned with the center line (Ap) of the runway (5), in order to determine, in step d), the said anchoring point (P) of the said final approach path (Aa):

- 30 - there is determined a predetermined final point, which is characteristic of the said approach mode selected by the pilot; and
- there is determined, as an anchoring point (P), the point having:
 - as longitude and latitude, the longitude and latitude of the said final point; and
 - as altitude, a predetermined altitude.

12. The method as claimed in claim 1 wherein, when the projection on the ground of the said characteristic segment (6) is parallel with the center line (Ap) of the runway (5), in order to determine, in step d), the said anchoring point (P) of the said final approach path (Aa):

- 5 - there is determined a reference point (R1) from which the pilot is considered to initiate a rotation of the aircraft in order to join a vertical plane containing the center line (Ap) of the runway (5), according to a reference path (T1);
- the said reference path (T1) is determined; and
- 10 - there is determined, as an anchoring point (P), the point (P2) which is such that the distance between the latter and the said reference point (R1) is substantially equal to the distance, along the said reference path (T1), between the said reference point (R1) and the vertical projection of the threshold (S) of the runway (5) on the said reference path (T1).

15 13. The method as claimed in claim 1 wherein, when the projection on the ground of the said characteristic segment (6) is parallel with the center line (Ap) of the runway (5), in order to determine, in step d), the said anchoring point (P) of the said final approach path (Aa):

- 20 - there is determined a reference point (R1) from which the pilot is considered to initiate a rotation of the aircraft in order to join a vertical plane containing the center line (Ap) of the runway (5), according to a reference path (T1);
- there is determined a horizontal straight line (D) which is located in a horizontal plane which is at a predetermined altitude and which is
- 25 partially merged with the vertical projection on the said horizontal plane of the said characteristic segment (6);
- there is determined a circle (C1) having the said reference point (R1) as its center and the distance between this reference point (R1) and the vertical projection on the said horizontal plane of the threshold (S) of the
- 30 runway (5) as its radius; and
- there is determined, as an anchoring point (P), the point of intersection (P1) between the said circle (C1) and the said horizontal straight line (D).

14. The method as claimed in claim 1 wherein, when the projection on the ground of the said characteristic segment (6) is parallel with the center line (Ap) of the runway (5), in order to determine, in step d), the said anchoring point (P) of the said final approach path (Aa):

- 5 - there is determined a horizontal straight line (D) which is located in a horizontal plane which is at a predetermined altitude and which is partially merged with the vertical projection on the said horizontal plane of the said characteristic segment (6);
- 10 - there is determined an intermediate point which corresponds to the vertical projection on the said horizontal plane of the threshold (S) of the said runway (5); and
- there is determined, as an anchoring point (P), the point (P3) corresponding to the orthogonal projection of the said intermediate point on the said horizontal straight line (D).

15 15. The method as claimed in claim 4 wherein the said predetermined altitude corresponds to the altitude of the threshold (S) of the runway (5).

20 16. The method as claimed in claim 4 wherein the said predetermined altitude corresponds to the altitude of the threshold (S) of the runway (5), increased by a predetermined value.

17. The method as claimed in claim 4 wherein the said predetermined altitude corresponds to the altitude of the ground at the location of the said anchoring point (P).

25 18. The method as claimed in claim 1 wherein the said characteristic segment (6) corresponds to the last segment of the said arrival path.

19. The method as claimed in claim 1 wherein the said characteristic segment (6) corresponds to the segment of the said arrival path which passes through an altitude which is characteristic of the approach mode selected by the pilot of the aircraft.

30 20. A device for determining a final approach path (Aa) of an aircraft for a non-precision approach, for the purpose of landing the aircraft on a runway (5), wherein it comprises means (2, 3) for implementing the method claimed in claim 1.

21. An aircraft wherein it comprises a device capable of implementing the method claimed in claim 1.